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Dr. Philip P. Calvert's Eightieth Birthday

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ENTOMOLOGICAL NEWS

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Outline of a New Classification for the Legion Lestes Selys (Order Odonata)

By Lt. Col. F. C. FRASER, I.M.S., Retd., Winton, Bournemouth, Hants, England

Selys, in 1862, published the first and the only monograph of the Legion *Lestes* which has appeared; later the Legion became known as the family *Lestidae*, belonging to the suborder Zygoptera within the order Odonata. In that monograph, Selys included five genera and 50 species but excluded three other genera which are now known to be true *Lestes*, viz., *Perilestes* Hagen, *Chlorolestes* Selys and *Synlestes* Selys; these he placed in the Legion *Podagrion*, now known as the family *Megapodagriidae*. Since 1862 a large number of new genera has been created and a still larger number of species has been discovered, so that the number of the former has more than quadrupled and the number of species trebled. Moreover, the family as a whole has acquired a new significance from a taxonomic point of view, since there is good reason to believe that the stem of the suborder Anisoptera and the whole of the recent Zygoptera (*Agriidae*) have had their origins in the *Lestidae*, that is to say, the *Lestidae* were the direct ancestors of the suborder *Anisozygoptera* from which all recent forms of Odonata have descended. From these considerations, there is no need to stress the need for a revision of the classification of the old Legion *Lestes*. With this in view, I have been collecting data and material for the past ten years and a comprehensive monograph is now nearing completion, but as it seems probable from the present difficulties in publication, that some time will elapse be-

fore this work can appear, I take this opportunity to present an outline of the new classification involved. It will be seen hereafter that three families are included under one superfamily for which the correct name should be *Lestoidea*, but unfortunately this name is pre-occupied by *Lestoidea* Tillyard, a genus in the family *Megapodagriidae;* thus I have been compelled to employ the name *Lestini* for the superfamily.

Superfamily **LESTINI**

(= Legion **Lestes** Selys plus Legion **Podagrion** pars Selys)

Zygopterous dragonflies of small, medium or, more rarely, large size, characterized by the elongation and production posteriorly of the anterior hamules of the male genitalia. Fore- and hindwings of approximately the same size and shape, with long slender petiole and usually elongate pterostigma; nearly always (save in the most primitive species) an oblique crossvein connecting Riii and IRiii about the middle of the wing (this vein representing the original site of a trachea which was borrowed by the intercalary from Riii). IRiii and Riv exhibiting a gradual lengthening towards the base of wing as traced from the more primitive to the more recent species.

Family 1. **PERILESTIDAE**

Small dragonflies with long and very slender abdomen. Venation characterized by the discoidal cell approaching or actually impinging on the posterior border of wing at which point the anal vein takes origin or is compressed between the discoidal cell apex and posterior border of wing; pterostigma quadrate, subquadrate or oval; oblique cross vein between Riii and IRiii absent or merely represented by the basal attached portion of IRiii.

Subfamily **Perilestinae**

Discoidal cell of forewings closed at base. Radius greatly thickened especially in its basal half.

Key to Genera of Subfamily Perilestinae

1. IRii only 3 cells in length, its inner end distal to the proximal end of pterostigma .....*Perilestes* Hagen. New World. Genotype *Perilestes fragilis* Hagen.
   IRii more than 3 cells in length, its inner end well proximal to the pterostigma ..... 2.
2. Discoidal cell impinging on posterior border of wing; Riv taking origin distal to subnodus .... *Perissolestes* Kennedy. New World. Genotype *Perilestes remotus* Williamson.
   Discoidal cell with apex slightly removed from posterior border of wing; Riv taking origin at the level of subnodus ..... *Nubiolestes* Fraser. Tropical Africa. Genotype *Eolestes diotima* Schmidt.

Subfamily **Chorismagriinae**

Discoidal cell of forewing with basal side absent and, therefore, open at base; Radius not markedly thickened; IRii with inner end well proximal to pterostigma; Riv taking origin at level of subnodus .....*Chorismagrion* Morton. Australia. Genotype *Chorismagrion risi* Morton.

Family 2. CHLOROLESTIDAE

Dragonflies of larger size and more robust build than in the *Perilestidae*. Wings of males frequently marked or banded with blackish brown or opaque white; pterostigma always more than twice as long as broad; intercalated veins well developed; IRiii arising at level of or widely distal or slightly proximal to subnodus; Riv arising at a variable distance proximal to or at level of subnodus.

Subfamily I. Chlorolestinae

Wings of males hyaline or more frequently banded with dark or blackish brown; IRiii and Riv both taking origin from a point nearer the nodus than arculus, the former vein usually at or but slightly distal to subnodus; anal vein leaving posterior border of wing at a point below the discoidal cell and far distal to the cross-vein *Ac*.

Key to Genera of subfamily Chlorolestinae

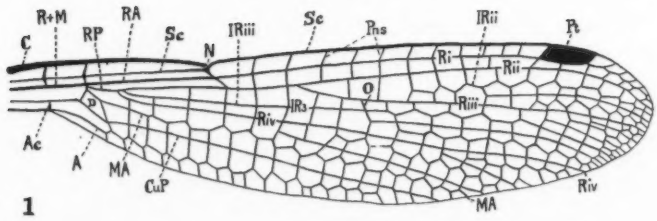
1. Origin of Riv proximal to subnodus ..... 2.
   Origin of Riv from the subnodus ..... 5.
2. IRiii arising at subnodus .....3.
   IRiii arising widely distal to subnodus ..*Sinolestes* Needham. China. Genotype *Sinolestes ornata* Needham.
3. Discoidal cell of forewing short and broad, its base about one third the length of posterior side; superior anal appendages of great length, ribbon-like, white ....*Episynlestes* Kennedy. Australia. Genotype *Synlestes albicauda* Tillyard.
   Discoidal cell narrow and elongate, its base less than one third the length of posterior side; superior anal appendages simple, forcipate, black .....4.
4. Anal vein separating from posterior border of wing distal to base of discoidal cell .....*Synlestes* Selys. Australia. Genotype *Synlestes weyersi* Selys.
   Anal vein separating from posterior border of wing proximal to or at level of base of discoidal cell ....*Ecchlorolestes* Barnard. S. Africa. Genotype *Chlorolestes peringuey* Ris.
5. Pterostigma bicolorous; inferior anal appendages of male bifid ..... *Euchlorolestes* Kennedy. S. Africa. Genotype *Agrion fasciatum* Burmeister.

EXPLANATION OF FIGURES

FIG. 1. Forewing of *Lestes sponsa* (Hansem) showing notation employed in this paper: A, Anal vein; MA, Medialis anticus or Median vein; N, Nodus; O, Oblique vein of *Lestes;* Pns, postnodal cross-veins; Pt, pterostigma; Ac, Anal-crossing or Cubital vein; C. Costa; D, discoidal cell or quadrangle; R + M, radius plus medius; RA, radialis anticus or anterior branch of radius; RP, radialis posticus or posterior branch of radius (Rs); Ri, Rii, Riii and Riv, branches of radius; IRii and IRiii, intercalated branches of radius; Sc, subcostal vein (the revised course is shown).

FIG. 2. Male genitalia of: a, *Perilestes remotus* Williamson; b, *Chorismagrion risi* Morton; c, *Lestes sponsa* (Hansem). Note the remarkable similarity between these distantly related species which were formerly placed in different families.

FIG. 3. Spaces between the veins Riv and MA showing 2 intercalaries present in *Paralestes* and a series in *Lestes.*


C
R+M
RP
RA
Sc
N
IRiii
Sc
Rns
IRii
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Ri
Rii
Riii
IR3
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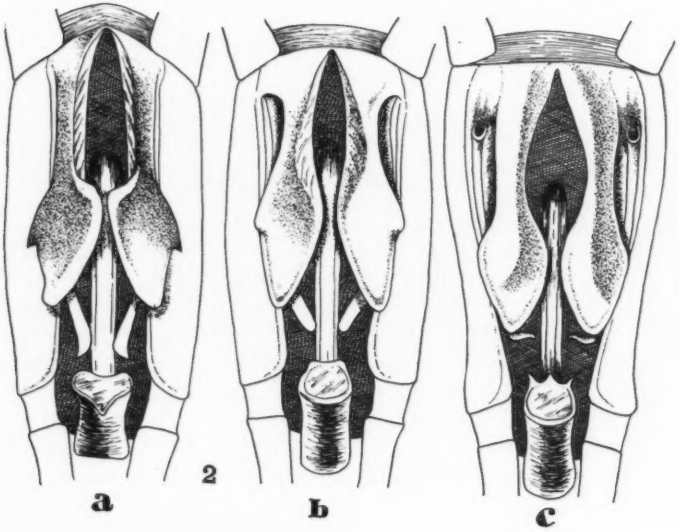
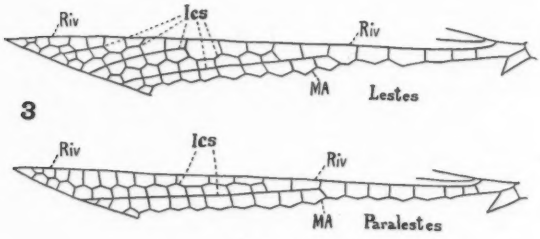
MA
CuP
MA
Riv
1


a
2
b
c


Riv
Ics
Riv
MA
Lestes
3
Riv
Ics
Riv
MA
Paralestes

FIGS. 1–3.

Pterostigma unicolorous; inferior anal appendages of male non-bifid ..... *Chlorolestes* Selys.
S. Africa. Genotype *Chlorolestes conspicua* Selys.

Subfamily 2. **Megalestinae**

Wings of both sexes always hyaline, uncolored; IRiii and Riv taking origin at a point nearer the arculus than to the nodus (as in *Lestes* sens strict.); anal vein leaving posterior border of wing at or often proximal to the level of *Ac*.

Only a single genus: *Megalestes* Selys.
Oriental. Genotype *Megalestes major* Selys.

Family 3. **LESTIDAE**

Moderately robust, medium sized or small, slender Lestine dragonflies. Discoidal cell well removed from posterior border of wing; an oblique vein invariably present between Riii and IRiii; anal vein leaving the posterior border of wing at the level of *Ac* (except in genus *Chalcolestes* Kennedy in which it is proximal to *Ac*); pterostigma nearly always longer than broad.

Subfamily I. **Sympecmatinae**

Small slender Lestine dragonflies which, when at rest, have the wings closely apposed over the dorsum of body. Discoidal cells of fore- and hindwings very narrow and differing in shape and size; pterostigma variable but usually less elongated and more imperfectly braced than in the next subfamily.

Key to Genera of Subfamily Sympecmatinae

1. Pterostigma of hindwing at a more proximal level than that of forewing, so that when the four wings are closed, those of the hindwings fail to coincide with those of the forewings; inner end of pterostigma oblique and continuous with brace ..... *Sympecma* Burmeister.
Palaearctic. Genotype *Agrion fusca* Lind.

Pterostigma of hindwing at the same level as that of forewing, so that with all the wings apposed, the hindwing pterostigma covers that of the forewing; inner end of pterostigma more or less truncate and often divorced from its brace ..... 2.

2. Veins at base of hindwing coated with long hairs; posterior border of wings at base showing a marked convex or angular expansion ..... *Tricholestes* nov. gen. Papuan. Genotype *Lestes risi* Van der Weele.

Veins at base of hindwing naked; no dilatation of wing bases ..... 3.

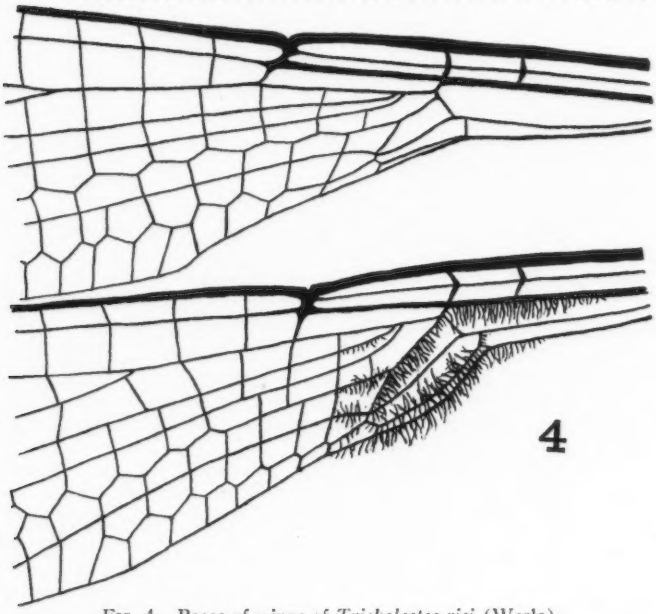


FIG. 4. Bases of wings of *Tricholestes risi* (Weele).

3. Wings tinted with yellow throughout; discoidal cells excessively narrow; pterostigma often bicolorous; markings of thorax and abdomen closely similar to those of *Sympecma fusca* (Lind) ..... *Indolestes* Fraser. Oriental. Genotype *Indolestes indica* Fraser.

Wings untinted; discoidal cells moderately narrow; pterostigma unicolorous; markings of thorax and abdomen differing broadly from those of *Sympecma fusca* .... *Austrolestes* Tillyard. Oriental, Australian. Genotype *Agrion cingulatum* Burmeister.

Subfamily **Lestinae**

Small to large Lestine dragonflies rather more robust than those of the preceding subfamily, and resting with their wings widely open. Discoidal cells of fore- and hindwings closely similar in size and shape; pterostigma (except in genus *Platylestes*) always considerably longer than broad.

Key to Genera of Subfamily Lestinae.

1. Pterostigma quadrate or subquadrate; thoracic markings reduced to scattered spots; anal appendages of female depressed, obtuse at apex ..... *Platylestes* Selys. Oriental. Genotype *Lestes platystyla* Rambur.

   Pterostigma elongate, rarely less than twice as long as broad; thoracic markings, if present, lineate or irregular in character: anal appendages of female conical, acuminate at apex ..... 2.

2. Anal vein separating from the posterior border of wing distinctly proximal to the level of cross-vein *Ac* .... *Chalcolestes* Kennedy. Palaearctic. Genotype *Lestes viridis* Lind.

   Anal vein separating from the posterior border of wing exactly at the level of *Ac* ..... 3.

3. The space between Riv and M not markedly widened at border of wing and enclosing only two long parallel intercalated veins. Dorsum of thorax frequently marked with metallic antehumeral bands which are hook-shaped above or deeply notched on the outer side .... *Paralestes* Schmidt MSS. Oriental Ethiopian. Genotype *Lestes praemorsa* Selys.

   The space between Riv and M markedly widened at border of wings and enclosing a series of gradually shortening intercalated veins. Dorsum of thorax variably marked but never with notched antehumerol stripes ..... 4.

4. Anal border of hindwing with an obtusely angulated dilatation opposite the discoidal cell; discoidal cells remarkably similar in fore- and hindwings, short and broad; Riii with its origin opposite the 2nd postnodal vein .... *Cyptolestes* Williamson. Neotropical. Genotype *Cyptolestes tuberalatus* Williamson.

   Anal border of hindwing normally shaped; discoidal cells fore- and hindwings differentiated, that of hindwing with its base shorter than the costal side ..... 5.

5. Riii markedly recessed towards base of wing, its origin situated opposite the Ist postnodal vein ... *Archilestes* Selys. Nearctic. Genotype *Lestes grandis* Rambur.
Riii with its origin widely distal to the Ist postnodal vein ..... 6.
6. Wings of male, save in *O. wallacei* (Kirby), broadly banded or spotted with blackish brown ... *Orolestes* McLachlan. Oriental. Genotype *Orolestes selysi* McLachlan.
Wings of male hyaline, unmarked ..... 7.
7. Large species with abdomen about 50 mm. in length, head, thorax and abdomen entirely green metallic. Pterostigma yellow, swollen ..... *Sinhalestes* gen. nov. Oriental. Genotype *Lestes orientalis* Hagen.
Smaller species with abdomen only 30 to 35 mm. in length, partly or non-metallic. Pterostigma black or brownish, elongate ..... 8.
8. Riv ending distally short of the level of pterostigma, especially in the hindwing ..... *Superlestes* Williamson. Neotropical. Genotype *Lestes exoleta* Selys.
Riv ending at or slightly beyond the level of pterostigma ..... 9.
9. General coloring more or less uniform sandy yellow or brown without metallic or dark markings except for a middorsal dark brown stripe on segments 8 to 10 (but very old adults may show stages of melanism). Pterostigma sandy yellow or with pale distal end .... *Xerolestes* gen. nov. Oriental. Genotype *Lestes pallida* Rambur.
Color usually more or less metallic with dark markings. Pterostigma usually black or blackish brown; dorsum of thorax may be wholly green metallic or with single or duplicate linear metallic stripes with a straight outer border ..... *Lestes* Leach. Cosmopolitan. Genotype *Lestes barbara* Fabricius.

Notes on Odonata of Surinam

V.[1] A New Species of Misagria with a Redescription of the Genus (Odonata: Libellulidae)

By D. C. GEIJSKES, Paramaribo, Surinam

The genus *Misagria* (Kirby 1889) has for a long time been represented by one species only, the genotype *M. parana* (Kirby 1889). A few years ago (1943), Kimmins [2] described a second species of this genus as *M. bimacula* from British Guiana, of which he says: "This species, which was placed, unnamed, under *Misagria* by McLachlan in his collection, differs in several respects from the genotype (*M. parana*), and were more material available, it might be necessary to erect a new genus for it."

During my explorations in Surinam, I twice collected a species of *Misagria* in the hilly country near the Brownsberg, about 100 km. south of Paramaribo, which proved to be not the common *M. parana* and which was set aside as probably new. After studying the publication of Kimmins, I was much surprised to find in it not my new species from the Brownsberg, but still another one which, however, shows some striking peculiarities in common with the Surinam species. The development of the anal loop in the hindwing and the structure of the male genitalia in both these species, as contrasted with the genotype *M. parana,* is especially remarkable. On the other hand, there are many points possessed in common with the genotype, so that it seems to me not necessary to create a new genus for the two discovered species in the Guianas although they do belong to a distinct

[1] Part I. *Rimanella arcana* Needham and its nymph (Odon. Zyg.). Revista d. Entomologia, 11 (1–2): 173–179; 8 figs. 1940. Part II. Six mostly new Zygopterous nymphs from the coastland waters. Ann. Ent. Soc. Amer., 34: 719–734; 6 figs. 1941. Part III. The genus Coryphaeschna, with descriptions of a new species and of the nymphs of *C. virens.* Ent. News, 54: 61–72. 1943. Part IV. Nine new or little known Zygopterous nymphs from the inland waters. Ann. Ent. Soc. Amer., 36: 165–184; 7 figs. 1943.

[2] Kimmins, D. E. 1943. A new South American Dragonfly (*Misagria bimacula* sp. n.). Ann. & Mag. Nat. Hist., Ser. II, Vol. X, pp. 156–159, 6 textfigs.

group. In other primitive Libelluline genera as *Cannaphila* and *Dasythemis* which are closely related to *Misagria,* we encounter also differences within the species, especially with regard to the length of the anal loop. For this reason I have extended the generic characters of *Misagria* as given below.

Misagria calverti nov. spec.

Male.—Face yellow, labium with a median black stripe of moderate width. Outer margin of labrum finely bordered with black. Upper part of frons brown with metallic blue shining; ocellar tubercle light brown, antennae black. Occipital triangle and rear of head brown, with some yellow markings below.

Prothorax brown, front and hind lobe and the dorsal median yellow, hind lobe more or less rectangular, without hairfringe on top. Pterothorax chocolate brown, crossed by yellow stripes as follows: a broad dorso-median stripe, which is continued between the wingbases in three spots. A second stripe along the upper side of the humeral suture, running downward over the mesinfraepisternum to the middle coxa. The first band covers the lower mesepimeron, connected on top with a yellow spot situated between the humeral suture and this stripe. Band 4 runs along the second suture, finely connected with band 3 in its upper part and crossing the suture line below the stigma, where it is widely connected with band 5 in the upper metepimeron. Stripe 5 in turn is connected in its upper part with band 6, widely extending the lower part of metepimeron.

The bands 2–6 replace largely the brown on the sides of pterothorax, with the result, that only three brown bands occur, viz., a large one under and along the humeral suture, a smaller second one over the stigma and a small third band in the middle or metepimeron. Poststernum yellow for the most part, the sides darkened.

Legs dark brown with lighter parts on the inner side of first femora and at the apical end and first tarsus joint of hind legs. Claws with a large additional tooth at 2/3 length. Abdomen dark brown, marked on segment 1–5 and on segment 7 with dorso-median and lateral yellow spots, reaching in segments 4, 5

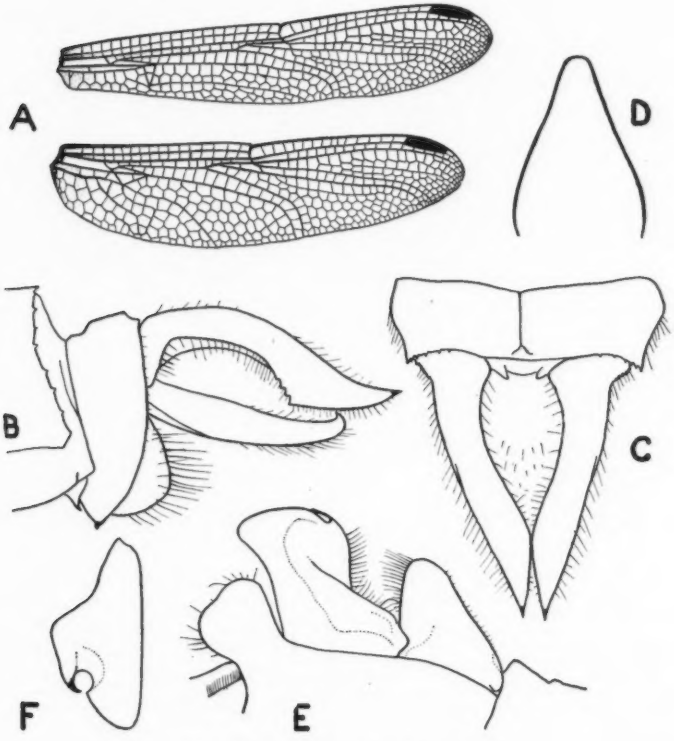
and 7 from base to half the segment length, in the basal segments covering a larger part. Segment 6 with a small lateral spot on each side only; segments 8, 9 and 10 black. Appendages red-brown; appendages superiores strongly curved in the basal half, the tips seen from the dorsal side convergent and pointed; on the under side a triangular projection at 3/5 the length, basal side of this projection armed with a few (4) small teeth. Inferior appendage triangular, reaching to half the distance of the projection and the end of the appendages superiores; apex rounded with two small upturned points.

Wings hyaline, with a small golden wingspot at base, stigmata brown. Antenodal crossveins $\frac{19.18}{16.16}$, last antenodal complete, postnodals $\frac{14.14}{14.14}$. Arculus at third antenodal, triangle with one crossvein, inferior triangle in front wings two- and three-celled. One bridge crossvein in front and hind wing and two cubito-anal crossveins in hind wing. Anal loop well developed and with a definite outer angle, projecting about two cells beyond the apex of the triangle, with a forked cell at the outer angle. Discoidal field in front wing starting with a row of two cells against the triangle, in hind wing with one row of three cells, followed by a row of two cells, two cells long. Membrane small, black. Golden wingspots diffusely fading distally, in front wing reaching to between first and second antenodal and cubito-anal crossvein, or one cell more; in hind wing to near the second antenodal and the second cubito-anal crossvein, ending at the margin 5 cells from the anal wing base.

Genitalia on second abdominal segment: anterior lamina large, triangular from the side, its anterior surface with a median furrow, apical margin distinctly excised. Hamule larger than lamina and hind lobe, outer lobe blunt quadrate, inner lobe in the form of a small hook directed caudad, separated from the outer lobe by a small excision. Hind lobe as high as lamina, broad rounded distally.

Total length 37 mm., abdomen 25 mm., hind wing 31 mm., front wing 33 mm., pterostigma 3–3.25 mm.

Female.—Similar to male, but the blue on frons less brilliant shining, the dorsal and lateral yellow spots on abdominal segments 3–5 and on segment 7 diffusely confluent. Dilated parts on segment 8 large and black. Wings hyaline, golden basal spots somewhat smaller than in male. Pterostigma dark red-brown.



Misagria calverti n. sp. holotype male

A, right fore and hind wing; B, abdominal appendages, left profile view; C, *idem*, dorsal view; D, appendix inferior, ventral view; E, genitalia of second adb. segm., left profile view; F, right hamulus, ventral view.

In front wing arculus distad from third antenodal, in hind wing at or just behind this crossvein; in hind wing three cubito-anal crossveins, antenodals $\frac{21.20}{16.17}$, postnodals $\frac{15.16}{13.12}$. In front wing discoidal field beginning from triangle two times with 3 cells wide, followed 2–3 cells long with a row of two cells wide; in hind wing discoidal field after triangle one time 3 cells followed 2–3 times by a row of two cells wide. Female otherwise as in male.

Total length 42 mm., abdomen 30 mm., hind wing 35 mm., front wing 37 mm., pterostigma 4 mm.

In spite of the difference in size between the male and the female, it seems to me that both the specimens belong to the same species.

SURINAM: Brownsberg, along bush path, settling on dry twigs, Sept. 14, 1938, one male; Sept. 19, 1938, one female (Geijskes leg.). *Holotype* male and *allotype* female in the author's collection.

I take great pleasure in naming this species after the nestor of the neotropical Odonata, Dr. Philip P. Calvert, on the occasion of the celebration of his 80th birthday, in appreciation of his help and encouragement in my study of the Surinam Odonata.

Generic characters of **Misagria**

Dark brown chocolate coloured species of moderate size, marked with yellow or yellow-green stripes and spots, the upper part of frons metallic violet shining and the hyaline wings with golden basal spots.

Eyes connected to one another over a short distance. Vertex with two small points, frons rounded, the median furrow distinct. Lobus of prothorax small rectangular with rounded corners, lying flat, without hairfringe. Pterothorax well developed, chocolate dark brown with yellow or yellow-green markings. Legs long, hind femur with several short spines, claws with an additional tooth at about 2/3 of the claw length. Wings long and slender, hind wing not much broader than front wing, pterostigma large, dark brown. Triangle in front and in hind wing

with one crossvein. Cu_1 in hind wing arising at the anal angle of triangle. Anal loop small and then reaching to the level of the distal end of triangle, or long foot-shaped and then projecting about two cells beyond the apex of triangle. One or two bridge crossveins, placed in proximal part of space and with two or three cubito-anal crossveins in hind wing. Discoidal field in front wing beginning at the triangle with two cells, sometimes (in ♀) twice with three cells.

Male abdomen slender, the first two segments swollen, segments 7–10 moderately widened and flattened; female with segments 3–7 wider, segment 8 with lateral expansions. Male genitalia: anterior lamina with the apical margin pointed forward, or in the median with a furrow and the apical margin excised; hamule large, outer lobe triangular or quadrate, inner lobe in the form of a small hook. Female genitalia: vulvar plate reduced, sides of segment 8 with lateral expansions.

Male appendages superiores with swollen basal part, dentated ventral surface with a triangular projection in the middle or at 2/3 the total length and with the apices pointed and curved upward or directed caudad. Appendage inferior broad triangular and divided at top, or smaller pointed with two upturned points at the apex.

Distribution: Guianas, Amazon, Ecuador.

Nymphs, unknown.[3]

Key to the species of Misagria

1. Anal loop of hind wing short, reaching to the level of the distal end of triangle, containing 8–10 cells. Sides of pterothorax marked with five large yellow stripes, the last ones partly confluent. Male genitalia: apical margin of anterior lamina bent forward; hamule widely excavated so that outer and inner lobes are widely separated, outer lobe triangular. Apex of inferior appendage broad and divided in two dents, which are not upturned.....
   Guianas, Amazon, Ecuador. *M. parana* Kirby

   Anal loop of hindwing long, footshaped, with a definite outer outer angle, projecting about two cells beyond the apex of

[3] I have reared one female nymph of *M. parana*, which is awaiting description.

triangle, containing 14–16 cells. Male genitalia: anterior lamina in the median with a furrow and the apical margin excised; hamule large, outer lobe quadrate, inner lobe in the form of a small hook, separated from the outer lobe by a small excision. Inferior appendage triangular, pointed to the end, apex with a small excision between two small upturned points.....2

2. Sides of pterothorax marked with five large yellow stripes, the last ones partly confluent. Male superior appendages curved in the basal part, the triangular projection on the lower surface after the middle; inferior appendage about 3/4 long as the superiors. Male genital hind lobe on top broadly rounded.....Surinam. *M. calverti* nov. spec.

Sides of pterothorax marked with yellow spots. Male superior appendages long, slender, hind points long and curved upward to subacute apices; the triangular projection on the lower surface before the middle; inferior appendage about half as long as superiors. Male genital hind lobe small lanceolate.....British Guiana. *M. bimacula* Kimmins

The Entomological Society of Canada

The ENTOMOLOGICAL SOCIETY OF CANADA is a new national society that will serve as a link between the various regional societies. The decision to form such a society was reached at the 87th annual meeting of the Entomological Society of Ontario on November 1–3. In addition to the Ontario society there are included the Acadian, the Manitoba, the British Columbia and the proposed Quebec society. The CANADIAN ENTOMOLOGIST will be published jointly by the Ontario and the regional societies and Dr. W. R. Thompson will continue as editor. The president of the new society is W. R. Ross of the Division of Entomology, Ottawa. The other officers are: A. W. Baker, R. H. Wigmore and A. B. Baird. There is a group of seven Directors that includes the presidents of the regional societies.

A Note on the Derivation of the Odonate Fauna of the Island of Ceylon

By F. F. LAIDLAW, Moniave, St. Lawrence, Ventnor, Isle of Wight

Ceylon is separated from the Indian mainland by a narrow strait barely 50 miles wide, and nowhere more than about 10 fathoms deep; partly bridged moreover by shoals and islands which form the well-known "Adam's Bridge." The northern part of the island is low-lying, the south-central area mountainous, the hills rising to a height of over 7000 ft. The plains are covered with savannah, the mountains carry a dense rain-forest Both plains and mountains are of course now-a-days largely under cultivation.

Zoologically, the island is a Province of the Indian Subregion (roughly the lands lying to the south of the great valleys of the Indus and Ganges), and its fauna differs from that of the mainland (Indian) Province to a considerable extent. On the one hand some of the characteristic Oriental forms found in India are lacking in Ceylon, the tiger is a familiar example; on the other Ceylon is occupied by several groups which are not found on the mainland. The Acavidae, a family of pulmonate land-mollusca, related to forms from the Seychelles and Madagascar, may serve as an instance. The dragonflies of these two Provinces show interesting differences, with which this note is concerned.

The Indian Subregion differs from the other Subregions of the Oriental Region briefly as follows:

Of the Zygoptera, the *Megapodagriidae* are absent, as are the *Platycnemidae* (except for the ubiquitous genus *Copera*); the *Chlorocyphidae* are poorly represented. Amongst the Anisoptera the Aeschnidae have relatively few species and no endemic genus. Some genera of the *Gomphidae* and of the *Libellulidae* otherwise widely distributed in the Region are not represented; one may quote *Sieboldius* and *Lyriothemis* as examples.

Both Provinces have special positive characters of their own. India has a radiation of 10 species of the Corduliine sub-family *Idionychinae,* of 6 species of *Protosticta,* and of about 12 species belonging to the *Protoneuridae,* referred by FRASER to five endemic genera. The Epallagid genus *Indophaea* has three species remotely allied to a Malaysian form; Chlorogomphus has 2 endemic species. None of these have been found in Ceylon. The only Subregional endemic genus shared by the two Provinces is *Platysticta* with which I deal below. This genus has two species in Ceylon, and one very distinct species in the extreme South of India.

The endemic Indian species are found mainly in the Western Ghats, the long mountain range which runs for nearly 800 miles from north to south along the west coast of the Indian Peninsula, reaching a height of over 7000 ft. in the Nilgiri and Anaimallai Hills. The range is largely covered with rain-forest, and is broken here and there by "gaps." Of these the Palghat gap which separates the Nilgiris from the Anaimallai Hills is the most important. Isolation of the forest-dwelling dragonflies in the several "sections" of the range has been sufficient to allow of some differentiation of the fauna of each of them. Thus *Chlorogomphus campioni* Fraser and *Indiophaea dispar* Rambur are found north of the Palghat gap only, whilst *Chlorogomphus xantheptera* Fraser and *Indophaea fraseri* Laidlaw are restricted to the hills to the South. The Ghats may in fact be looked on as a chain of islands of forest and mountain separated from each other by a "sea" of low-lying, somewhat arid country; and Ceylon may be likewise regarded as a similar but more isolated island. The Ceylonese mountains are about 200 miles distant from the nearest hills of India.

The number of species of dragonflies recorded from Ceylon is 100, allowing for a few doubtful entries. I have listed them below in three categories as follows:

I. Species found in India, and in many cases with a wide distribution through the Oriental Region.

Neurobasis chinensis Linne.
Lestes elata Selys.

Lestes praemorsa Selys (= *decipiens* Kirby).
Copera marginipes Rambur.
Ceriagrion cerinorubellum Rambur.
Ceriagrion coromandelianum Fabricius.
Aciagrion hisopa Selys.
Aciagrion occidentale Laidlaw.
Pseudagrion microcephalum Rambur.
Pseudagrion malabaricum Fraser.
Enallagma malayanum Selys.
Enallagma parvum Selys.
Ischnura senegalensis Rambur.
Ischnura delicata Hagen (= *aurora* Brauer).
Agriocnemis pygmaea Rambur.
Agriocnemis femina Brauer.
Ictinogomphus rapax Rambur.
Anax immaculifrons Rambur.
Anax guttatus Burmeister.
Hemianax ephippiger Burmeister.
Gynacantha hyalina Selys.
Cratilla lineata Brauer.
Lathrecista asiatica Fabricius.
Potamarcha obscura Rambur.
Orthetrum pruinosum neglectum Rambur.
Orthetrum chrysostigma luzonicum Brauer.
Orthetrum glaucum Brauer.
Orthetrum triangulare triangulare Selys.
Orthetrum sabina Drury.
Orthetrum chrysis Selys.
Brachydiplax sobrina Rambur.
Diplacodes trivialis Rambur.
Diplacodes nebulosa Fabricius.
Acisoma panorpoides Rambur.
Crocothemis servilia Drury.
Bradinopyga geminata Rambur.
Neurothemis tullia Drury.
Neurothemis intermedia intermedia Rambur.
Rhodothemis rufa Rambur.
Sympetrum fonscolombei Selys.
Trithemis kirbyi kirbyi Selys.
Trithemis aurora Burmeister.
Trithemis pallidinervis Kirby.
Trithemis festiva Rambur.
Tholymis tillarga Fabricius.
Pantala flavescens Fabricius.
Tramea basilaris burmeisteri Kirby.

Tramea limbata Desjardins.
Hydrobasileus croceus Brauer.
Zyxomma petiolatum Rambur.
Rhyothemis variegata Linne.
Rhyothemis triangularis Kirby.
Urothemis signata Rambur.
Macrodiplax cora Brauer.
Aethriamanta brevipennis Rambur.

Ceylon shares with S. India *Hylaeothemis fruhstorferi* Karsch. This genus has one other species in Borneo, and one in the N. W. Himalaya.

It also shares a subspecies *Sita* Campion of *Indothemis limbata* Selys, the nominate species is found in Lower Burma and Malaya.

I have recorded an unidentified species of *Mortonagrion* from the island (LAIDLAW 1924). FRASER (1936) thinks that the record of *Aethriamanta brevipennis* is due to an error. He also suggests that *Hemicordulia asiatica* Selys. and *Neurothemis fulvia* Drury will be added to the list.

II. Representative species, presumably derived from the same stock as existing Indian species.

Vestalis (*Vestinus*) *apicalis nigrescens* Fraser.
Pseudagrion rubriceps ceylonicum Kirby.
Paragomphus henryi Laidlaw.
Cyclogomphus gynostylus Fraser.
Burmagomphus pyramidalis sinuatus Fraser.
Megalogomphus ceylonicus Laidlaw.
Microgomphus lankanensis Fraser.
Heliogomphus nietneri Selys.
Heliogomphus lyratus Fraser.
Heliogomphus ceylonicus Selys.
Heliogomphus walli Fraser.
Microgomphus wijaya Lieftinck.
Gomphidia pearsoni Fraser.
Epophthalmia vittata cyanocephala Hagen.
Macromia zeylanica Fraser.
Tetrathemis yerburyi Kirby.
Zygonyx iris ceylonica Kirby.
Onychothemis testacea ceylonica Ris.

III. Species which do not fall into either of the above categories.

Euphaea splendens Selys.

The nearest allies of this species are Malaysian forms such as *variegata* Rambur.

Libellago 4 sp.

A radiation of species perhaps resulting from the absence of competitor pressure. One of them, *indica* has, I believe, invaded the Indian mainland. It was first described by FRASER (1928) as a race of *lineata* from S. India, where it ranges as far north as Poona.

Lestes (*?*) *orientalis* Hagen.

This large species is quite unlike anything known from the Indian Province. FRASER tells me (in litt.) that it is probably generically distinct from true *Lestes* and may be near *Orolestes,* a genus which is known from the Himalaya, through Indochina to Malaysia.

Lestes (*Ceylonolestes*) *gracilis* Hagen.

Lestes (*Ceylonolestes*) *divisa* Selys.

These species belong to a section of the genus which is mainly characteristic of Indochina. A species closely allied to *gracilis* is however found in S. India to the south of the Palghat gap.

Drepanosticta (*Ceylonosticta*) 11 sp.

A radiation presumably also resulting from absense of competitor pressure. It is worth noting that a single species of *Drepanosticta* which is probably allied to the Ceylon forms is found in the Andaman Is. where too a *Libellago* occurs. *Drepanosticta* is not found in Peninsular India, it occurs in Assam, Burma, Malaysia, and further east.

Platysticta 2 sp.

Very distinct from any other Oriental genus. I believe it to be related to the genus *Palaemnema* of S. America. In discussion with FRASER he admits that this is possible though he had (1938) put the latter genus in a subfamily of its own.

Elattoneura 3 sp.

The genus is found in India, and as far to the east as Malaysia. The Ceylon species are all very distinct, and do not suggest near relationship with other species.

Prodasineura sita Kirby.

Regarded by FRASER as related to *autumnalis* Fraser from Burma.

About 57% of the species are held in the *first category.* Two only of these, *Hylaeothemis fruhstorferi* and *Indothemis* show

definite relationship with Indochinese or Malaysian stock. The remainder are almost all of them forms which live in low-lying country, often with a rather arid climate. Some of them are known to have migratory habits (e.g., *Sympetrum fonscolombei*), others have a very wide range, and probably all of them are capable of crossing from the mainland at the present time by way of Adam's Bridge either actively or passively.

The *second category,* 18% of the species, consists of forms whose opportunities of reaching the island have been few, perhaps unique. Most of them are forest dwellers, and many show the effects of prolonged isolation—marked differentiation from the parent stock. Rapid permeation of the stock has probably been helped in some cases by the relatively small area occupied by a species.

25% of the species fall into the *third category.* Twenty of these are definitely related to Burmese or Malayan forms. This specific percentage is exaggerated by the presence of the two radiations, *Libellago* and *Drepanosticta.* The three species of *Elattoneura* give little help to guide us in speculating as to their origin.

The two species of *Platysticta* (along with their Indian congener) are the most interesting members of the fauna. The genus is probably a surviving remnant of an ancient fauna which now has no other representatives in the area. Both S. India and Ceylon are believed to be very old land surfaces, and the survival in them of "palaeogenic" forms is quite possible.

The presence of the very definite Malaysian and Indochinese elements in the fauna of Ceylon, and to a lesser degree in that of S. India would involve at the present time a migration of roughly 1000 miles across the Bay of Bengal, or an equally lengthy journey in conditions unfavourable climatically, round the coast of the Bay.

Two suggestions have been made as to means which would make such a passage possible:

The first is that insects may be carried passively from time to time across the Bay by the N. E. Monsoon wind, which blows steadily and persistently across the bay from the north-east during the winter months.

Migration of this sort could only be a rare accident, and successful colonization very exceptional.

The species listed in the third category certainly suggest a random "selection." It will be noticed that all of them are Zygoptera and not strong fliers, it is possible that the possession of strong power of flight may make a passive migration less likely. Compare CALVERT's (1942) notes on the fauna of the West Indian islands.

The second suggestion, which I owe to Prof. ZEUNER, is that there was a connection between Ceylon and the Indian mainland in Pleistocene times, and that great climatic fluctuations took place in that Period when it is possible that the "equatorial rain-belt lay a little further to the North than it does today. This may have enabled species to migrate round the coasts of the Gulf of Bengal."

To sum up. In addition to the ordinary lowland Oriental and Palaeotropical fauna, about 57% of all its Odonata, Ceylon has about 18% of forms related to Indian species but differentiated more or less, by isolation.

The remainder for the most part show affinities to Burmese or Malayan forms, and it is suggested that such forms have reached Ceylon either as passive immigrants carried by seasonal (Monsoon) winds, or have travelled round the coasts of the Bay of Bengal in Pleistocene times, when physical and climatic conditions differed from those of today.

Lastly the Ceylon and Indian species of the genus *Platysticta* are regarded as *palaeogenic*, that is as survivals of a very ancient fauna.

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On the Life of William T. Davis [1]

By H. M. Parshley, Northampton, Massachusetts

When William T. Davis died in 1945 at the age of 82 he was among the last of the vanishing race of all-round naturalists. He spent a large part of his life tramping the woods and fields of Staten Island, and he was on terms of the utmost familiarity with the whole fauna and flora of the region. He was an indefatigable collector and a specialist of world-wide standing on the taxonomy of the Cicadidae. But he was more than this, and in her excellent biography [2] Miss Abbott presents with gratifying clearness the eccentric, old-fashioned, keen-minded, simple, sincere, thrifty, generous, and lovable character that hundreds of people —from country boys and New York business men to John Kieran and Edwin Way Teale—remember with affection and, most of them, with a sense of definite obligation in one way or another. Shortly before his death, for example, Mr. Davis identified a collection of cicadas for the writer, and when he returned them he generously sent also a handsomely bound volume of his papers on the group.

Davis's life was identified with Staten Island; he was an an authority on its history, its houses and antiquities, as well as on its biology; and he was the guiding spirit and chief financial support of its Institute of Arts and Sciences. It is good to know that his extensive collections of insects in various orders are well housed on the top floor of the Museum of the Institute where they are under the care of Mr. Joseph F. Burke, and that the Davis types of numerous new species are also safe, having been deposited in the American Museum of Natural History in New York. The ancient Victorian house where Davis lived most of his life, at 146 Stuyvesant Place, still stands with its bushy dooryard and overgrown flagstones, a strange anachronism

[1] Contributions from the Department of Zoology, Smith College, No. 226.

[2] *The Life of William T. Davis,* by Mabel Abbott, Cornell University Press, 321 pp., $3.50. October, 1949. Some of the material in the present article is taken from a review accepted for publication in the book review section of a New York newspaper about a year ago, which never appeared in print.

among modern business blocks; but it is no stranger than the man who once lived there, and before long it, too, will disappear.[3] His family had some means, but he worked faithfully for twenty-five years in a New York business office, retiring at forty-six so that he could devote all his time to his scientific and historical interests. He kept a journal and published a book, "Days Afield on Staten Island"; and he contributed numerous papers to scientific journals, describing as new more than half of the 170 known species of North American cicadas. When he ventured away from Staten Island it was usually to attend meetings of entomological societies in New York, Brooklyn, and Philadelphia, or to make collecting trips on Long Island or in New Jersey. Davis was most frugal and abstemious with himself, lunching on bits of chocolate and crackers to save a few cents, and in later years he unnecessarily feared the approach of penury; but in his will he left $20,000 to the Historical Society and almost $100,000 to the Institute.

As Miss Abbott abundantly shows in her sympathetic portrait, Davis was always himself, a man devoid of vanity, affectation, vices, or ostentation. He worked early and late in his attic museum, and he was a fountain of wisdom and knowledge to young and old within the sphere of his varied interests. Encountered in the open, he was a strange apparition: small and spare, dressed in dusty black, wearing a battered stiff straw hat; burdened with an old army knapsack, a black umbrella, and an insect net which was often stowed under his coat behind; his face adorned with a large, red nose and a straggly mustache, his eyes shining through rimless glasses—an odd figure to be sure, but somehow radiating kindliness, intelligence, and an infectious joy in every aspect of nature, including people—except perhaps

[3] Last summer the writer made a pious pilgrimage to Stuyvesant Place where part of the Institute library is temporarily located in charge of Miss Abbott in the old Davis house (now the property of a bank) at No. 146, and a few blocks down the street the Davis collections and other matters of interest are to be found in the permanent Museum building. Davis's urge for "keeping things" is well exemplified in such items as boxes containing hundreds of duplicate specimens of *Pseudolucanus capreolus* and the like. And Mr. Burke, a specialist in the study of diatoms, has beautiful specimens to show the visitor, including a series of many species taken from the cranium of *Pithecanthropus erectus*.

those who set forest fires and "improve" landscapes. Several of Miss Abbott's excellent illustrations show Davis collecting in full regalia. The writer recalls an occasion when a large class of carefree students from the Biological Laboratory at Cold Spring Harbor came upon Mr. Davis in the field. He was equipped as described above and must have seemed a comic figure to the boys and girls who had never seen or heard of him before. But after lunch they got a different impression in the laboratory as he named their specimens and modestly shared other information with them. In a few minutes even the most careless felt the presence of the unusual and gave him their respectful attention: "He knew so profoundly what he was talking about and clothed the subject in such homely charm and interest."

Davis had a wide acquaintance among the entomologists of his time—including, among many, Wheeler, Leng, Olsen, Mrs. Slosson, Bequaert, Torre-Bueno—and Miss Abbott traces out most of these relationships in detail, quoting from letters and from Davis's journal. But many others besides entomologists were reached by Davis's influence. When he was over seventy he was still leading study trips of the local Bird Club and Nature Club and "going on antique hunts with members of the Historical Society." It is notable how often even the most casual acquaintanceship took on the tone of friendship. Many young boys became interested in science through Davis's generous efforts and in later life remained firm friends and admirers, like the soldier who wrote from Holland: "It seems forever since I have seen a man as civilized, as unforgettable."

He was truly a rare and striking personality, even, as Mr. Teale says in his introduction to Miss Abbott's book, "a symbol of the good life." His was not the life for everyone, to be sure, but still it was a good life, for in it he solved in his fashion the problem all must face: how at once to follow the inner light, meet the material demands of life, and maintain a genial warmth in human relations. He loved natural woods and fields and such relics of the past as old houses and tombstones; he was apprehensive of the complexities, conflicts, and encroachments of recent years. As his biographer says, "this was what he believed in —keeping things from being lost or destroyed."

Current Entomological Literature

COMPILED BY R. G. SCHMIEDER

Under the above head it is intended to note papers received at the Academy of Natural Sciences of Philadelphia and the University of Pennsylvania, pertaining to the Entomology of the Americas (North and South), including Arachnida and Myriopoda. Articles irrelevant to American entomology will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species will be recorded.

This list gives references of the year 1950 unless otherwise noted. Continued papers, with few exceptions, are recorded only at their first installment.

For other records of general literature and for economic literature, see the Bibliography of Agriculture, Washington, and the Review of Applied Entomology, Series A, London. For records of papers on medical entomology see Review of Applied Entomology, Series B.

NOTE: The figures within brackets [ ] refer to the journal in which the paper appeared, as numbered in the List of periodicals and serials published in our January and June issues. The number of the volume, and in some cases, the part, heft, &c. is followed by a colon (:). References to papers containing new forms or names not so stated in titles are followed by (*); if containing keys are followed by (k); papers pertaining exclusively to Neotropical species, and not so indicated in the title, have the symbol (S).

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Reviews

INTRODUCING THE INSECT. By F. A. Urquhart. New York: Henry Holt and Co. 1949. Pp. x, 287, 4 colored pls., 160 text figs. Price $5.00.

To write a textbook for the beginner in entomology is a particularly difficult task, as it involves selection of examples from a group which contains more species than all the rest of the animal kingdom. Dr. Urquhart has been very successful in choosing insects which are well distributed on the continent, and which may be commonly seen by most interested observers.

The make-up of the volume suggests that its primary function is to assist the amateur to identify common insects down to the family level. The use of illustrated keys to accomplish this purpose is to be highly commended. The introductory chapters on making, preparing and housing an insect collection, and on anatomy, life history and procedures in identification are particularly clear and easy to follow. The illustrations appear to be well done and quite satisfactory for the purpose intended.

There is a list of general reference books for the reader who wishes to pursue the subject further.—M. E. PHILLIPS.

ATLAS OF SCALE INSECTS OF NORTH AMERICA. Series V. PSEUDOCOCCIDAE (Part 1). By Gordon Floyd Ferris. Stanford University Press, Stanford, California, Nov. 1950. Pp. vii + 278, 108 full-page illustrations. Price $7.50.

This part includes about half the known species. Unlike the earlier series by Professor Ferris, this is not "loose-leaf" but is a well bound volume and is called "Volume 5," at least on the jacket and on the cover. There is an introduction of 19 pages, and there are keys to the genera and to the species. Following the style established in the other series, the textual material is held to a minimum and each species is illustrated by a full page of reproductions of careful pen-and-ink drawings.—R. G. SCHMIEDER.

THE MAYFLIES OF FLORIDA. By Lewis Berner. University of Florida Press, Gainesville, Fla., 1950. xii + 267 pp., 131 illustrations. Paperbound $5.50.

A systematic treatment with keys to genera and species of both the adults and the nymphs, well illustrated with many line cuts and numerous full page half-tones of adults and nymphs. In addition to the systematic and distributional data, the book gives a good general introduction to the group, and under each species tells what is known of its ecology, its habits and its seasonal distribution. These biological data are often very detailed and occupy most of the page space. Altogether, this is an excellent book, well produced on coated paper.—R. G. SCHMIEDER.

THE CLASSIFICATION OF ANIMALS. An introduction to zoological taxonomy. By W. T. Calman, formerly Keeper of Zoology, British Museum (Nat. Hist.). Methuen Monographs on Biological Subjects, Methuen and Co., Ltd., London; John Wiley, New York, 1949, vii + 54. Price $1.25.

In spite of its small size, this booklet gives a remarkably clear and complete statement of the aims and methods of zoological taxonomy. It can be heartily recommended to students setting out to study insects and also to many already engaged in taxonomic work in order that they may profit by accepting the suggestions on good usage in systematic publication that are included. Among the topics taken up are the species question (together with a discussion of sub-specific categories), the genus and higher categories, nomenclature, types, the International Code, descriptions and diagnoses, keys, illustrations, measurements and publication. Finally, there is a short list of those books that are indispensable to the systematist.—R. G. SCHMIEDER.

EXCHANGES

This column is intended only for wants and exchanges, not for advertisements of goods for sale or services rendered. Notices not exceeding three lines free to subscribers.

These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and, only when necessary those at the top (being longest in) are discontinued.

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